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THE PREPARATION OF THREE COLLUVIAL SOIL SAMPLES FOR NEWMONT EXPLORATION LIMITED

C.W. Smith, P. Westra and D.G. McIntosh

June, 1987

Project 30.69.99
Cost Recovery

Job No. 025299

MINERAL SCIENCES LABORATORIES
DIVISION REPORT MSL 87-6(CR)

CONFIDENTIAL

THE PREPARATION OF THREE COLLUVIAL SOIL SAMPLES FOR NEWMONT EXPLORATION LIMITED

C.W. Smith, P. Westra and D.G. McIntosh *

ABSTRACT

Under a cost recovery arrangement with Newmont Exploration Limited of Toronto, three colluvial soil samples were comminuted, blended and bottled for intended usage as reference materials. Work was carried out in the period April to June, 1987 at the Reference Materials preparation facilities of the Chemical Laboratory, Mineral Sciences Laboratories, CANMET.

Keywords: geochemical analysis, reference materials, colluvial soils, gold, silver, arsenic, antimony.

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* Staff of Reference Materials Research Section, Chemical Laboratory.

INTRODUCTION

In March 1987 the Mineral Sciences Laboratories of CANMET undertook the preparation of three colluvial soil samples at the request of Newmont Exploration Limited of Toronto. These are intended as candidate reference materials for analyses of gold, arsenic, antimony and silver and are from the Carlin region of Nevada. The preparative requirement and the cost recovery arrangements subsequently agreed to are summarized in Annex 1.

Prior to the start of work, the requirement was amended as described in Annex 2.

The three samples, identified as Vivian, Genesis and Blue Star East respectively, were received at the Mineral Sciences Laboratories on April 6, 1987. Processing was complete on June 15, 1987 and the prepared samples were shipped to Tucson, Arizona at the request of Newmont on June 18, 1987.

SUMMARY OF PREPARATIVE WORK

Approximately 400 kg of each material was received packed in 45 gallon drums. Each material was carried through the processing steps independently with meticulous cleaning of the equipment between the usage for each material.

Drying and preliminary communition was performed in manageable batch lots of about one quarter of the sample. Each sample was spread on stainless steel trays for drying on a steam-heated pipe bed at about 100 degrees Celcius with periodic mixing. The dried sample was then sieved through a 4 mesh* (4.75 mm opening) wire cloth screen and the oversize was then discarded. The undersize was comminuted by jaw-crushing (only as required), passage through a Denver roller mill and, finally, grinding in 30 kg lots in a steel ball mill, typically for 30 minutes. The ground material was sieved through a 200 mesh (75 um opening) stainless steel screen on a Russell-Finex siever.

The plus 200 mesh material was again ball-milled, resieved and the second minus 200 mesh fraction collected was combined with the original.

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* The instructions (Annex 2) specified discarding of plus 10 mesh material. However, it was immediately apparent that this would yield insufficient quantities for the requirement. Following consultation with W. Coker of G.S.C., the technical consultant designated by Newmont, this was changed initially to 6 mesh, and finally to 4 mesh.

The minus 200 mesh material was blended in one lot for 15 hours in a 540 L capacity conical steel blender. Two litre plastic bottles were filled directly from the blender outlet port with 2 kg lots of the blended powder. Each bottle was labelled with the sample name and its number in the bottling sequence to facilitate sampling for homogeneity testing.

The daily log prepared by J. Pollard details the preparative steps. It is attached as Annex 3. Processing recoveries are summarized in Table 1.

Table 1 - Summary of processing recoveries.

	Vivian	Genesis	Blue Star East
Dried wt., kg	484.	381.5	389.
-4 mesh, kg	344.	331.5	314.
-200 mesh, kg (1st ball milling)	239.	235.6	225.9
-200 mesh, kg (2nd ball milling)	69.4	47.6	53.1
-200 mesh, kg (total)	308.4	283.2	279.0
No. 2-kg bottles	153	140	138

In accord with the client's instructions, the materials were crated and shipped to Newmont in Tucson, Arizona via Consolidated Freightways c.o.d.

SUMMARY OF EFFORT DISTRIBUTION

The processing work was carried out by J. Pollard, a temporary employee of Newmont Exploration, with expert assistance provided by D.G. McIntosh and P. Westra of CANMET. P. Westra supervised the work and provided logistics management.

Table 2. Effort distribution.

	Classification	Hours
J. Pollard	light ind. labourer	360.
D.G. McIntosh	GL-MOC-7	12.
P. Westra	GL-PRW-8	12.

COST OF CONSUMABLE ITEMS

The Table summarizes the cost of items purchased specifically for this project.

Item	Cost, $
Sieve screens, stainless steel wire cloth (W.S. Tyler Co., 2 @ $70.)	140.
Bottles and lids, 2L plastic (Brown's Bottles, 560 @ $0.80, plus tx.)	500.54
Shipping cartons (4 @ $25.50, plus tx.)	114.24
Total	754.78

ANNEX 1

LETTER OF AGREEMENT

Energy, Mines and Resources Canada
Research and Technology
Canada Centre for Mineral and Energy Technology,
555 Booth Street,
Ottawa, Canada
K1A 0G1

Énergie, Mines et Ressources Canada
Recherche et Technologie
Centre canadien de la technologie des minéraux et de l'énergie,
555, rue Booth,
Ottawa, Canada
K1A 0G1

Your file / Votre référence

Our file / Notre référence

March 25, 1987

Mr. J. Alan Coope
Director of Geochemistry
Newmont Exploration Ltd.
33 Yonge Street, Suite 370
Toronto, Ontario
M5E 1T2

Dear Mr. Coope,

The attached description and cost estimate for the preparation of gold-bearing reference samples, Annex I, responds to your recent request. If you are in agreement that the terms of this statement are satisfactory, please sign the Agreement below to initiated this project.

Yours truly,

L.L. Sirois
Director, Mineral Sciences Laboratories

Letter of Agreement

I agree that this Letter and the attachment Annex I respond satisfactorily to the request by Newmont Exploration Ltd. to CANMET of March 1987.

(signed)

March 26, 1987 (date)

for Newmont Exploration Ltd.

Canada

Annex I : L.L. Sirois to J.A. Coope, 25 March 1987

Work Estimate : Preparation of gold-bearing soil reference samples

Client: Newmont Exploration Ltd. Toronto, Ontario
(contact: J. Alan Coope, Director of Geochemistry)

Requirement: Prepare three soil samples of approximately 275 Kg each by comminution and screening to minus 200 mesh, blending, and bottling in 2 Kg units in plastic bottles.

Source: CCRMP facility, Chemical Laboratory, Mineral Sciences Laboratory.

Estimated duration: up to four weeks, depending on comminution properties.

Proposed start-up: 1 April 1987

Procedures:	Est.Days
Drying and pebble removal (if required)	3
Comminution and screening (ball-milling and/or roller crushing)	15
Blending (16h each)	3
Bottling (approx. 410 units)	1.5
Packing for shipment	0.5

Cost Estimates:

Equipment		
-200 mesh stainless steel screen		$150.
-420 2L plastic bottles plus lids		$525.
-printed labels (if required)		$150.
-shipping		*
Labour; estimated**		
temporary laborer: 160h at $7.75	=	$1240.*
GL-MOC-7: 10h at $32.57	=	$ 325.70
GL-PRW-8: 10h at $36.21	=	$ 362.10
Total estimated costs recoverable by CANMET		$1512.80
Total estimated costs to client		$2752.80 (plus shipping)

*to be paid by client directly to agency. CANMET will arrange hiring of and supervision of a temporary labourer on the client's behalf.

**actual labour charges to be based on actual labour hours.

END OF ANNEX I

Prepared by C.W. Smith, MSL, CANMET 87-03-24

ANNEX 2

FINAL INSTRUCTIONS

33 YONGE STREET, SUITE 370
TORONTO, ONTARIO M5E 1T2

TEL. (416) 362-1687
TELEX 0622121
FAX (416) 864-0925

NEWMONT EXPLORATION LIMITED

A SUBSIDIARY OF NEWMONT MINING CORPORATION

GEOCHEMISTRY

March 27, 1987

Dr. C. W. Smith
Mineral Sciences Laboratory
CANMET
555 Booth Street
Ottawa, Ontario
K1A 0G1

RE: Preparation of Gold-Bearing Soil Reference Samples

Dear Clint:

This letter will summarize the arrangements for the preparation of the gold-bearing soil reference samples for Newmont Exploration Ltd.

Three samples of colluvial soil material from the Carlin area of Nevada have been shipped via Consolidated Freightways under Waybill No. 267-85014-4. The three samples are contained in 6, 55 gallon drums (2 drums per sample) and are labelled as follows:

1. Vivian
2. Genesis
3. Blue Star East

The total weight of the samples, including the drums is 3405 lbs. (1548kg.)

The drums are addressed to you at CANMET and the shipping label describes the contents as "Geological Material, No Commercial Value". For expedience, CANMET's customs agent, Charles Higgerty Ltd., is named on the label.

The samples should arrive in Ottawa on or about April 1, 1987.

Please sieve each of the samples through a 10 mesh screen, discarding the oversize. Select a representative 325kg. of the minus 10 mesh material of each sample and prepare the required reference samples by comminuting and screening to minus 200 mesh, blending and bottling in 2kg. units in plastic bottles.

I acknowledge acceptance of the Work Estimate, Annex I to letter from L.L. Sirois to J.A. Coope dated March 25, 1987 detailing timing, procedures and cost estimates. It is understood that the estimates will be modified in accordance with my request that 325kg. of each sample be processed rather than 275kg.

I am grateful for CANMET's assistance and co-operation in the preparation of these reference samples and I look forward to hearing from you in due course.

Yours Sincerely,

J. Alan Coope
Director - Geochemistry

JAC/ljm
cc: W. B. Coker

ANNEX 3

DAILY LOG

Vivian + 4" 387.5 lbs.
B.S.E + " 242.5 lb.

MON APRIL 6/87

1:00pm - RECEIVED 6 DRUMS OF GOLD-BEARING SOIL. OPENED ALL 6 TO IDENTIFY AND LABEL.

2:30-4:00pm - LOAD ~ HALF A DRUM OF VIVIAN ON DRYING TRAYS.

TUE APRIL 7/87

8:00AM - MOVED ALL DRUMS INTO DRYING ROOM.
- TOTAL NET WEIGHT OF FIRST DRYING LOAD ~239.5 lbs.

10:00AM - RAN LOAD THROUGH No.10 MESH. RECOVERED ONLY 102 lbs (~42%)

2:00pm - RAN THE REMAINING + THROUGH No.6 mesh AND RECOVERED AN EXTRA 36 lb FOR A TOTAL OF ~ 138 LBS (~58%). SHOULD NOW BE ABLE TO RECOVER ABOUT 325 Kg. No.6 MESH WILL BE USED FROM NOW ON.

3:30-4:20pm PUT -6 THROUGH ROLLERS

WED APRIL 8/87

7:00AM - PUT REMAINING AMOUNT OF 1ST DRUM OF VIVIAN ON DRYING TRAYS.

8:00AM - FINISHED ROLLING FIRST LOAD.

11:00AM - STIRRED SOIL ON TRAYS TO QUICKEN DRYING TIME

1:00 pm - PUT THE REST OF 1ST DRUM THROUGH 6 MESH

2:00 pm - ROLLED HALF

4:00 pm - PUT 1ST HALF OF 2nd drum ON DRYING TRAYS.

THUR APRIL 9/87

8:00AM - REMOVED DRY LOAD AND REPLACED ANOTHER ½ DRUM ON TRAYS.

9:00AM - FINISHED ROLLING FIRST DRUM.

10:00AM - SIEVED 1ST HALF OF SECOND DRUM THROUGH 6 MESH

12:30 pm - ROLLED " " " " ".

½ DRUMS PRODUCED ~ 466 lbs OF -6 MESH ~ 211.5 Kg.

FRI APR 10

8:00 - REMOVED LAST OF VIVIAN FROM DRYING TRAYS AND REPLACED IT WITH GENESIS.
10:30 - SIEVED LAST HALF OF 2nd DRUM (V)
12:00 - BEGAN ROLLING "
2:00 - FINAL TOTAL -6 MESH ~ 274.5 Kg.

MON APR 13

8:00 - REMOVED 1ST HALF OF GEN AND REPLACED WITH 2nd HALF.
9:00 - RE-SIEVED REMAINING + THROUGH 4 MESH. RECOVERED 69.5 ~~Kg~~ Kg
TOTAL ~ 313.0 Kg. 244 Kg (V. 0.)
- WET SCREENS OF 55.0% AND 64.5% FOR -200 m.
1:30 - SIEVING GEN (4 MESH)
- SIEVING VIV -200 MESH)
3:30 - REMOVED GEN 2nd HALF FROM TRAYS AND REPLACE WITH 2nd DRUM OF GEN.

TUE APR 14

8:00 - PUT LAST OF GEN ON DRYING TRAYS.
10:30 - JAW-CRUSHING, SIEVING, AND ROLLING GEN.
2:30 - BALL MILLED -4 FOR 15 min (-200 ~ 14%) (VITIAN
3:30 - PUT BLUE STAR E. IN DRYING TRAYS

WED APR 15

8:00 - ~~REMOVED~~ PUT MORE BSE IN DRYING TRAYS
9:00 - ROLLING GEN
3:30 - MORE BSE IN DRYING TRAYS

THUR APR 16

8:00 - LAST OF BSE IN DRYING TRAYS
9:00 - FINAL ROLLED WEIGHT OF GEN 331.5 Kg.
3:00 - CLEAN-UP.

TUE APR 21

800 - REMOVED LAST OF BSE. DRYING IS COMPLETE.

10:30 - SIEVING BSE.

- BALL MILL OF -4 FOR 30 MIN, WET SCREENED AT 85% -200 (VIVIAN)

WED APR 22

8:00 - ROLLING, SIEVING BSE.

THUR APR 23

8:00 - FINAL NET WT. OF BSE -4 is ~ 314 Kg

- -200 TOTAL VIV (138 lbs)

FRI APR 24

(VIVIAN.):

8:00 - PUT 65 lbs OF -4 INTO BALL MILL ($\frac{1}{2}$ hr)

11:30 - "

1:30 - "

2:45 - "

- RECOVERED 43.5 lbs OF -200 (TOTAL - 181.5 lbs)

MON APR 27

9:15 - RECOVERED 42 lbs OF -200 (223$\frac{1}{2}$ lbs.)

2:20 - " 40 lbs " (263.5 lbs)

TUE APR 28

9:30 - RECOVERED 51.5 lbs OF -200 (315 lbs)

- PUT 65 lbs OF -4 INTO BALL MILL ($\frac{1}{2}$ hr)

2:20 - "

WED APR 29

11:00 - RECOVERED 63 lbs OF -200 (378 lbs)

1:45 - BALL MILL - 65 lbs -4 ($\frac{1}{2}$ hr)

THUR APR 30

8:30 - RECOVERED 47 lbs of -200 (425 lbs)
9:30 - 65 lbs -4 into BALL MILL (½ hr)
1:30 - "

FRI MAY 1

8:30 - RECOVERED 102 lbs of -200 (527 lbs)
11:30 - REGRIND OF 65 lbs OF +200 (½ hr)
- WET SCREEN OF REGRIND +200 (72.6% -200m)

MON MAY 4

10:00 - RECOVERED 51 lbs OF -200 (578 lbs)
- REGRIND OF 65 lbs +200 (½ hr)

TUE MAY 5

12:00 - RECOVERED 41 lbs -200 (619 lbs)
- WET SCREEN OF REGRIND +200 (60% -200m)

WED MAY 6

8:30 - 65 lbs OF REGRIND + 200 INTO BALL MILL

THU MAY 7

12:00 - FINAL TOTAL OF -200 MESH VIVIAN ~ 650 lbs.

GENESIS:

FRI MAY 8

8:00 - 65 lbs OF -4 INTO BALL MILL (½ hr)
10:00 - SIEVING ON -200
11:00 - 65 lb OF -4 INTO BALL MILL (½ hr)

MON MAY 11

8:00 - RECOVERED 64 lbs OF -200 (64 lbs)
9:30 - 65 lbs -4 INTO BALL MILL (½ hr)
3:30 - "

TUE MAY 12

2:00 - RECOVERED 86 lbs OF -200 (150 lbs)

WED MAY 13

9:30 - 65 lbs INTO BALL MILL
2:00 - RECOVERED 117 lbs OF -200 (197)

THUR MAY 1

9:30 - 65lbs of -4 into ball mill (½hr)
10:00 - Recovered ~54.5 lbs -200m (251.5 lbs)
2:15 - 65lbs of -4 into ball mill (½hr)
4:30 - Recovered ~56.5 lbs of -200m (~308 lbs.)

FRI MAY 1:

10:30 - Put 65lbs -4 into ball mill (½hr)
12:00 - Recovered ~47lbs of -200m (355 lbs)

TUE MAY 19

10:30 - 65lbs -4 into ball mill (½hr)
- Recovered ~52.5 lbs of -200m (407.5lbs)

WED MAY 20

9:30 - 65lbs -4 into ball mill (½hr.)
11:00 - Recovered 58 lbs of -200m (~465.5 lbs)
1:50 - 65 lbs -4 into ball mill (½hr)

THUR MAY 21

9:30 - Recovered ~54 lbs of -200m (~519.5 lbs)
11:30 - Put 65 lbs of +200 into ball mill (~25min)

FRI MAY 22

9:00 - Recovered ~44 lbs of -200 mesh (~563.5 lbs)

MON MAY 25

8:00 - 65 lbs of +200 Regrind into ball mill (25min)
4:30 - Recovered 61 lbs of -200. FINAL TOTAL = 624.5 lbs

TUE MAY 26

BLUE STAR EAST:

2:00 - Put 65lbs of -4 into ball mill (½hr)
4:00 - "

WED MAY 27

10:00 - Recovered 50 lbs of -200m (50lbs)
11:00 - 65 lbs -4 into ball mill (½hr)
1:00 - "
4:00 - Recovered 64 lbs of -200m (114lbs)

THUR MAY

12:00 - RECOVERED ~46 lbs of -200 m. (162 lbs)
- WET SCREEN OF -200 IS 100% ∴ NO HOLES IN SCREEN.
2:00 - 65 lbs of -4 INTO BALL MILL (½ hr
- RECOVERED ~49 lbs of -200 m (~211 lbs)

FRI MAY 7

9:00 - 65 lbs of -4 INTO BALL MILL (½ hr)
1:00 - "

MON JUN 1

9:00 - RECOVERED 99 lbs of -200 m (~310 lbs)
11:00 - 65 lbs -4 INTO BALL MILL (½ hr)
2:30 RECOVERED ~63 lbs of -200 (373 lbs)

TUE JUN 2

9:00 - PUT 65 lbs of -4 INTO BALL MILL (½ hr)
11:30 - RECOVERED ~63 lbs of -200 (~436 lbs)
1:00 - 65 lbs of -4 INTO BALL MILL (½ hr)

WED JUN 3

8:30 - RECOVERED ~62 lbs of -200 (498 lbs)
9:30 - 65 lbs of REGRIND +300 INTO BALL MILL (25 min)
11:30 - " (30 min)

THU JUN 4

3:00 - RECOVERED 65 lbs of -200 (563 lbs)

MON JUN 8

4:30 - RECOVERED 52 lbs of -200. FINAL TOTAL (615 lbs)

TUE JUN 9

- BLENDED VIVIAN SAMPLE FOR 15 hrs OVERNIGHT.
11:00 - 4:00 - BOTTLED 100 2 kg SAMPLES.

WED JUN 10

8:00 - BOTTLED 53 2 kg SAMPLES.
- PREPARED BLENDER
- BLENDED BSE OVERNIGHT (15 hrs)

THUR JUN

8:00 - BOTTLED 135 2Kg SAMPLES
- BLENDED GENESIS FOR 15 hrs OVERNIGHT.

FRI JUN

8:00 - BOTTLED 140 2Kg SAMPLES.

MON JUN

	CRATED	SAMPLES	CONTENTS	WEIGHT
#1	144	BTLS.	VIVIAN	(TOT WT. = 322 Kg.)
#2	130	btls.	GENESIS	
	3	"	VIVIAN	
	1	"	EMPTY	(TOT WT. = 323 Kg)
#3	138	btls	B.S.E.	
	6	"	VIVIAN	(TOT WT. = 322 Kg)
#4	128	btls	EMPTY	
			REMAINING LIDS	(TOT WT. = 21 Kg)